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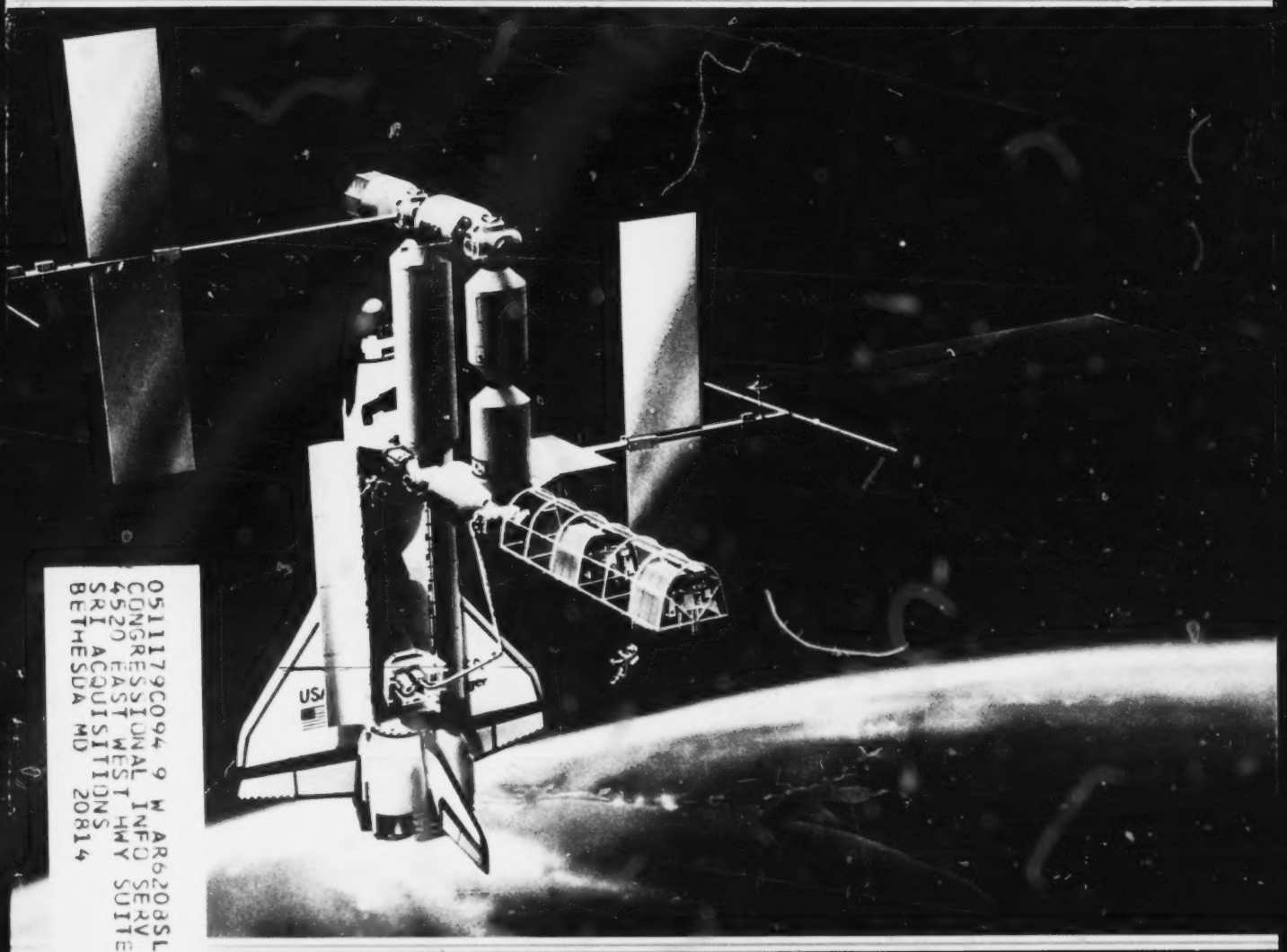
FEBRUARY 20, 1984

CHEMICAL & ENGINEERING

NEWS



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SPACE POLICY

New era starts with space station Page 9

Cover: Artist's conception of future space station. Photo courtesy of NASA

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CHEMICAL & ENGINEERING
NEWS
FEBRUARY 20, 1984

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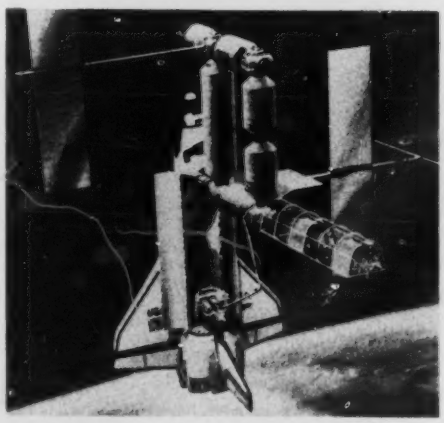

News Focus

Space station goal marks beginning of new era, but some fear Star Trek will become Star Wars. **Page 9**

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LETTERS

Kudo to Dick Moore

SIR: Richard L. Moore's "Comment" in C&EN, Dec. 19, 1983, page 51, deserves a serious reading by every member of the American Chemical Society.

Moore gives well-deserved credit to others for contributions they have made in behalf of ACS public relations. I have observed his very effective personal efforts in behalf of the society's public relations efforts. ACS as well as all chemists and chemical engineers enjoys a better rapport with the public at large thanks, in part at least, to Dick Moore.

This "kudo" is to make note of the professional job he has done as an outstanding chemist member of ACS and the public relations community.

O. A. Battista
World Olympiads of Knowledge, Fort Worth

Experimenting with truth

SIR: I was surprised but very gratified by Wil Lepkowski's review (C&EN, Jan. 16, page 63) of my book "Experimenting with Truth"—for two reasons. First, his review itself was in the nature of the very dialogue I seek to engender within our scientific communities of the largest questions and issues of existence. Second, because he spotted the obvious incompleteness of this one book as a statement of life-policy (a word I substitute for "faith"). I hope to fill in those blanks with my personal statements soon.

In the meantime, however, I would like to call the attention of those readers who are interested in contemporary statements about "meaning" to two brilliant and sparkling books with surprising insights: "The Faces of Science" (and also "Realms of the Unconscious") by Soviet mathematician V. V. Nalimov, ISI Press, 1981, and "To An Unknown God" by Petru Dumitriu, Seabury, 1982. These are poetic and profound works about profound subjects written in a linguistic metaphor and style which professional scientists, whether positivists, agnostics, Hindu, Jewish, or Christian, can all immediately understand.

Rustum Roy, *Director*
Materials Research Laboratory
Pennsylvania State University

SIR: I haven't read the book yet, but I was intrigued by Wil Lepkowski's review of "Experimenting with Truth" by Rustum Roy.

If there are scientist readers of this review who feel that their lives need further moral underpinnings, but who have no impression of the existence of gods, God, or even Rustum Roy's "***," I would suggest that they investigate the American Humanist Association. Its main tenet is that there are no "beings" or "essences" watching over us, any more than "they" watch over other earthly fauna or flora. A corollary tenet is that to achieve a more loving, helpful, rewarding, civilized human life, we need but follow the "golden rule," which was expressed by Confucius over 2500 years ago.

Richard M. Lemmon, *Berkeley, Calif.*

SIR: Wil Lepkowski's review of "Experimenting with Truth" by Rustum Roy was excellent. While commending Roy's objective of bringing about dialogue between agnostic scientists and theists, he has succinctly exposed the contradiction between Roy's beliefs and basic Christianity.

I applaud C&EN for publishing this review so that the Christian message was presented in an uncompromising way.

William J. Schell
Separex Corp., Anaheim, Calif.

Corrections

- Jan. 23, page 31: The correct name of the liquid heavy-duty detergent being marketed in the U.K. by Stridebond is Cool Force, not Cold Force.
- Jan. 23 page 32: The table of Western European producers of fatty alcohols (detergent-range) should include Albright & Wilson, with a capacity of 25,000 metric tons per year, and the correct figure for Henkel is 170,000 metric tons. Total nameplate capacity is 397,000 metric tons, and demand 215,000 metric tons per year.
- Jan. 23, page 34: The patent situation regarding detergent zeolites was incompletely described. Henkel has patents on the use of zeolites as detergent builders in most countries, and is still trying to obtain patent coverage in the U.S. It has granted application licenses to Colgate-Palmolive, Procter & Gamble, and Unilever, to other detergent makers in Germany, to producers in France and Switzerland, and to detergent producers in Japan, including top producers Kao Soap and Lion Corp. Henkel also has teamed up with Degussa, with both companies pooling their respective patents on composition of matter and process, to form the 50-50 joint venture company Sasil-Patent Verwertungsgesellschaft. This company has issued process licenses to various companies around the world. Akzo, as well as U.S. producers Ethyl, W. R. Grace, PQ, and Union Carbide, has its own production processes.

U.S. Space Policy Ready for Next Big Leap

The big goal is now set—a space station in 10 years—and shuttle missions with science payloads abound in 1984; big question remains extent of military involvement

Wil Lepkowski, C&EN Washington

These are days of high rejoicing within the U.S.'s 450,000-member aerospace community. The National Aeronautics & Space Administration, now a mite over a quarter-century old, will begin developing its long-cherished space station, once Congress approves the $150 million the Administration is asking. The usefulness of NASA's space shuttle is established beyond any doubts. And the space altruists now feel the stage is set for some real pioneering again.

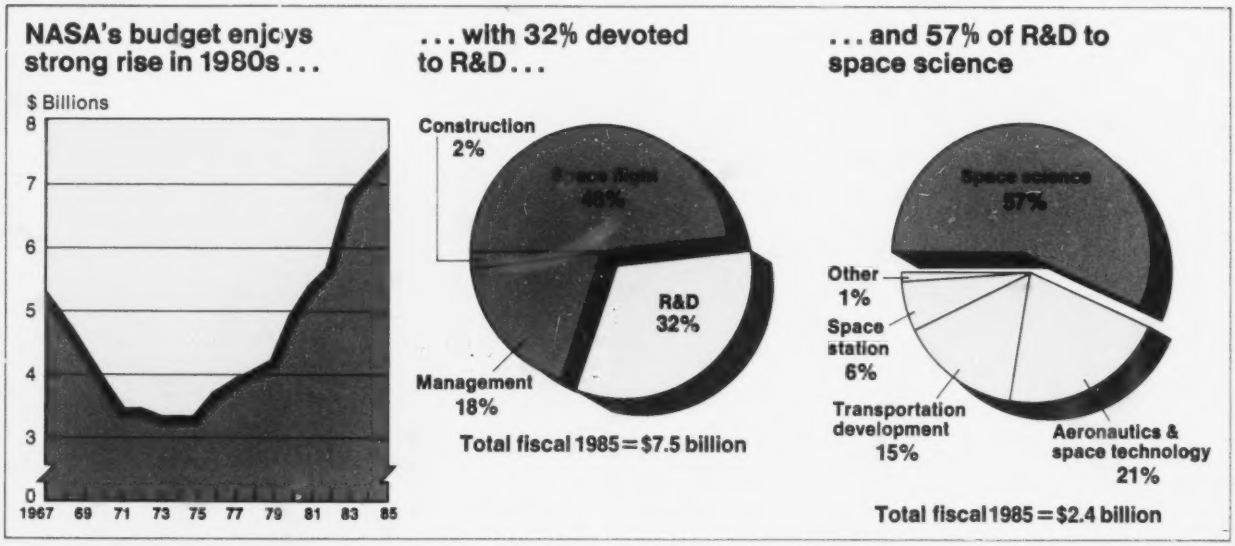
At the same time, the aerospace and weapons community also is celebrating. The military budget for space activities passed NASA's last year, and it's said that more than $30 billion will be spent by the Pentagon on laser and particle beam weaponry alone through fiscal 1989. Much of it will be placed on the ground but will require space-based hardware for the complete systems to work.

So as space becomes militarized, grand dreams and grim cold war realities face public discussion and Congressional debate as a new era in space opens. Within all this is the vast internationalization of space with its accompanying sets of stresses, strains, and promises. Will space be monopolized by the superpowers? Is the U.S. lead in profit-making space technology being threatened by Europe and Japan? Should not space be seen as "commons" where cooperation and not competition rule the day? Must the countries of Earth take their deadly squabbles into that commons?

Big questions. Big issues. Meanwhile, NASA's menu of launchings for 1984 is its busiest in history. Ten shuttle missions are scheduled, along with 12 unmanned scientific payloads. Two dozen communications satellites are going up, plus two Earth resource satellites and one weather satellite. The rest are secret military payloads and scientific experiments that will be aboard the shuttle. The European Space Agency, Japan, and India, too, are looking ahead to busy years.

And everyone knows, of course, that the Soviet Union is going to be more than active.

"The world of space technology is now very different from what it was in the 1960s and even late 1970s," declares John Logsdon, who follows space policy closely as director of the graduate program in science and technology policy at George Washington University. "The players are different, and the issues



are different. What went on during those times did not have a very strong linkage to economics and security. But increasingly there is that link now to core values in society. We tend to think of space activities as a unity. But in fact they make a diverse variety. The Trekkies of a few years ago are today's entrepreneurs," Logsdon says.

All this is to say that satellites, like any of mankind's inventions, can be peacekeepers or war makers. The spacecraft operated by the Central Intelligence Agency and the Air Force are so sensitive to the electromagnetic commands generated at Soviet missile sites, that the President could have as much as a three-day warning of Soviet missile firings. Satellites today are the crux of any global command and control system. They see, they hear, and they tell, and more and more international firms are seeing them that way, too.

Space is where mankind's ambitions fuse optimally with mankind's technology. At NASA the latest manifestation of that fusion is the space station and the agency's plans to involve private venture capital and corporate investment in it as much as possible.

"The space station," declares NASA Administrator James M. Beggs, "provides a logical stepstone approach to the exploration and exploitation of space. We are entering an era when commercialization of space will become truly important."

Right now, commercialization is established only in the field of satellite technology. But the list of noncommunications companies with ambitious hopes and plans is growing. The companies bear names like Eros Data, Astrospace, Ecosystems International, Fedex Spacetran, Orbital Systems, and Spacewatch. They join older line companies like Du Pont, Aluminum Co. of America, Honeywell, Eli Lilly, 3M, and Johnson & Johnson in exploring all manner of research on materials development and processing. And so it goes. The commercial and economic phase is here, incipient, loaded with skeptics, but attracting investment capital.

NASA was scheduled this month to make public its study of space commercialization policy. Commercialization policy will be a bit muddied for a while because politics and cost make private investment chancy. Only in communications technology has industry become well established and almost self-sufficient in space. In short, the Administration is groping for a working space commercialization policy.

Two years ago, Congress' Office of Technology Assessment said in a report that "there is no overall agreement about the direction or scope the civilian space program should assume in the future." The report said that the lack of agreement on "appropriate goals" was making it difficult for the executive agencies to set specific timetables for developing space systems that meet user needs, to encourage private sector investment, and to initiate new and/or implement mandated programs. In addition, the report said the Reagan Administration had general ideas but "no clear and predictable ways" of defining the transfer of NASA's research, development, and demonstration programs to the private sector. OTA says it sees no reason to change the report's conclusions.

Early last year, the government announced plans to sell its weather satellites to the private sector. A public and Congressional uproar put an end, if temporarily, to that plan. But the Administration, following an earlier Presidential executive order, has put out for bids its sale of NASA's land resource satellites. The Commerce Department, handling the bids, will be announcing qualifiers in a month or so. If no bids are acceptable, NASA will continue with development of resource satellites on its own.

But the sale of such public service satellites as weather and remote sensing craft presents so many economic, political, international, and management problems that critics complain that NASA and the government have not really thought things through. This is what makes space so complicated and probably too involved to expect that there can be anything like a comprehensive space policy.

Said Arnold Frutkin, assistant to the international group president at Burroughs Corp., in the September 1983 issue of *Spectrum* (a publication of the Institute of Electrical & Electronic Engineers): "President Reagan's recent notion to turn weather and Earth survey satellites over to the private sector, when it is widely recognized that there is no commercial viability for such systems without government subsidy, threatens the hard-won precedents of international public service developed over decades. Lighthouses might, by a considerable stretch of the imagination, be run for profit by private companies, but something would be lost to the world if they were."

Adds David Williamson, space analyst at Georgetown University's Center for International & Strategic Studies, "A single private entity to own and operate all civil U.S. remote sensing systems would create an effective monopoly potentially dangerous to technical progress and to the economic and social interests of the users." He also says too much financial subsidy would be needed at this stage of technology. Maybe the best alternative, he believes, would be a government/private sector venture chartered by Congress.

But international competition presses on the U.S. efforts, and many feel the Administration will have to put a coordinated effort forward soon. "Without a strategy to guide them," says David W. Lippy, president of the Center for Space Policy of Cambridge, Mass., a consultant firm specializing in helping firms develop space-related ventures, "American companies will lose their competitive edge to companies abroad.

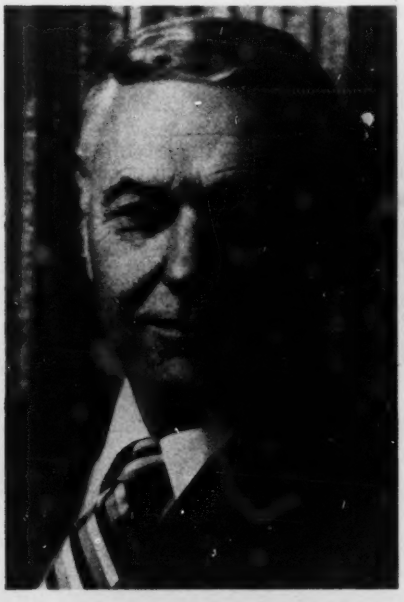
"Arianespace, a European consortium, is marketing the launch vehicle Ariane, a successful competitor to the U.S. shuttle. (Ariane is not a shuttle but a so-called expendable launch vehicle that drops to sea once it releases its payload.) In 1984, another European concern, Spot Image, will market remote sensing packages that surpass the capabilities of the American Landsat system. These companies are only the first trickle in a flood of foreign competition, not all of which are in the aerospace industry."

The Administration lacks an overall commercialization policy, but it does seem to be developing separate policies, sector by sector. NASA, for example, is planning to turn over its Atlas/Centaur rocket launching systems to General Dynamics Corp., the firm that has been building them for NASA since the 1960s. Last month, the agency chose Transpace Carriers Inc., Greenbelt, Md., to take over from NASA the marketing of another expendable launch vehicle, the Delta rocket. Delta is NASA's workhorse for lifting middleweight scientific and communications satellites into orbit.

Another possibility is on-orbit services, or special satellites that would be supply stations and even manufacturing facilities for the various special satellites being launched. The West German firm Messerschmitt-Boilkow-Blohm (MBB) developed a Shuttle Pallet Satellite, called SPAS, and last June Fairchild Industries announced plans to build and launch a Leasecraft platform that would provide a base for as many orbital utilities the platform would have room for. One of the first Leasecraft lessees could be NASA's extreme ultraviolet telescope scheduled for deployment in 1987. It would be placed on the Fairchild craft by the space shuttle. Leasecraft's costs are expected to be about $200 million and would come from private venture capital sources.

SPAS, however, seems to be ahead of Fairchild in its scheduling. MBB has joined with the experienced Comsat Corp. and a venture capital firm. Their initial instrument will be a remote sensing device that will compete with Landsat and the French SPOT system. The SPAS initial investment is about $75 million.

In any case, space entrepreneurship really does seem



C&EN staff photo

NASA's James Beggs (left) sees space station as logical stepstone to space exploration. Former Air Force colonel Robert Bowman (center) is critical of Star Wars strategy. University of California's George Pimentel (right) argues for colonizing the moon through an international effort

The space station—a primer on the next big goal of the U.S. space program

What is the space station?

It is an outpost in space, a potential way station toward colonizing the moon, the beginning, if you will, of a space city. It's a modest beginning, of course, since in 10 years it would contain besides crew quarters and a command module, only a laboratory for zero-gravity experiments, an astronomical observatory, a facility for making materials under zero gravity, and room for attaching instruments for studying Earth and its atmosphere. It also would be a base from which to repair satellites in orbit. It would be built piece by piece from materials transported aloft by the space shuttle. It would have a crew of about 10 and cost a total of about $8 billion. Its life span would be 15 to 20 years.

Why is the space station such a big deal?

The space station is a boost to NASA's goal of being a pioneering agency, and to the space enthusiasts who foresee factories and cities in space. Indeed, some liken space stations to the frontier forts of America's pioneer days. Forts were shelters for travelers, trading posts, medical centers, battle stations, and bases for expeditions. So would tomorrow's space station function.

What are some objections to the space station?

Skeptics claim that the station is an extravagance and that in combination with the shuttle it deprives basic space science of needed money. However, manned space exploration excites the public and Congress much more than do wholly instrumented projects. As Joel Hinners, director of Goddard Space Flight Center, points out, "There's no better system to integrate information than man."

NASA claims to blunt the argument that the station will rob space science of support. It says space science prospered during the expensive Apollo program. And although there will be no basic science involved in the development and construction of the station, once it is built, there will be no end to opportunities for science. Everyone from materials scientists and biochemists to astronomers will have opportunities to design instruments and experiments to further advance their fields in the weightlessness and clarity of space.

What is an example?

NASA makes a point of emphasizing the powerful potential of the space station for astronomy. It envisages an assembly of permanent observatories, including such instruments as an orbiting, very long baseline interferometer, infrared submillimeter telescope, infrared interferometer, ambient deployable infrared telescope, hundred-meter thinned aperture telescope, and very large space telescope. The instruments could be serviced more easily on a platform in

to be proliferating. The consulting firm Booz-Allen & Hamilton has a $200,000 contract from NASA to identify areas in which companies can profit from space laboratory service—analogous to clinical and materials laboratories at zero gravity. The firm has become a prime source of information for venture capitalists and entrepreneurs to find one another to discuss financing opportunities.

As Booz-Allen's Peter M. Stark explains, early profits in materials experimentation in space will derive from a privately owned space laboratory probably aboard NASA's space station. It will be financed, as one might expect, by a group of investment firms and will make its profits by selling laboratory services to customers wishing to have experiments done in zero gravity. The design of such a multipurpose laboratory would mean big opportunities for chemical companies in the laboratory design business, but this one would really be a high-tech affair.

This aspect of commercialization, in contrast to private ownership of utility satellites or development of private space transportation services, has its own set of problems. "What is worrisome," says George Washington University's Logsdon, "is the campaign to create the impression that we soon will see privately owned orbiting factories, private launches bringing valuable products to and from orbit, and a joint public-private space program based on, more than anything, space manufacturing.

"The major obstacles to commercial operations in space are the high cost of space activities and the uncertainties about the feasibility of potential commercial opportunities in areas such as advanced communications, remote sensing, and, particularly, space manufacturing. There is a need for a research program looking into these things."

Logsdon believes space should be sold on several merits, not simply the promise of high-profit commercialization, a phenomenon that could be half a century away.

Thus, a host of unanswered questions and problems remain unanswered. One of the most important issues within all that is squaring this Administration's free market philosophy with international cooperation in commercialization.

What space commercialization competition is showing is that the world is indeed interconnected, especially when U.S., European, and more Japanese investment capital combine to finance the launching of new space ventures. The intercontinental communications cooperative Intelsat, made up of 108 countries, is probably the prototype of international ventures. Although the Soviet Union is not a member, several Eastern European countries, plus China, are.

So, says Georgetown's Williamson, "The rest of the world is going to be heard more and more on international space policy."

Where the two big space superpowers are creating global anxiety is in their plans to militarize space beyond its present role as preserver of global stability. As the world now knows, President Reagan has begun a massive research and development program

space than if they were in individual orbits.

Will there be foreign involvement?

At present there are no plans to involve the Soviet Union or the Eastern bloc countries. But NASA says that although no commitments have been made, the European Space Agency, West Germany, France, Italy, Canada, and Japan are all doing studies to establish where they might fit in. NASA Administrator James M. Beggs already is making plans to tour foreign capitals in the spring to explain the station and solicit ideas for cooperation. "We hope they'll spend a lot of money with us and devote a lot of their resources," he says.

Will the space station push the state of the technical arts?

A lot of applied research and technological developments will be needed to develop a successful space station. NASA says generic areas of new technology will include materials and structures, energy conversion, controls, human factors, propulsion, and fluid/thermal systems. The biggest challenges will involve development of an enormous information system monitoring and controlling all elements of the station. Cryogenic fluid management will be a special need, as will be propellant transfer and storage.

How about private sector involvement?

NASA Administrator Beggs says he wants as much private venture capital and activities as possible in station development and operation. What will most likely happen is that companies will make or buy laboratories, or sections of laboratories, then rent them out to other companies. NASA, too, could be a laboratory lessor as well. But space business is expensive, costing up to two orders of magnitude more than doing comparable work on Earth. So the payoff has to be equally high.

To pave the way for the new era of commercialization, NASA plans to assess the kinds of changes that will be needed in tax laws and regulations that it says "discriminate against space ventures."

Beggs believes that private firms will operate their own space stations and transportation vehicles by themselves. "You will have the equivalent of a Federal Aviation Agency, the sort of certification, air worthiness certification, air traffic control, and things of that kind."

Will the military be involved?

According to Beggs: "Our military has to this point stated that they have no requirement to go up. Should they have a requirement, or develop a requirement over time, it would undoubtedly be as a separate activity. That is, they would have their own module, for their own security reasons. This is intended to be a civil program."

leading to systems to defend the territory of the U.S. and its allies from incoming nuclear warheads. Such systems could include laser and particle beam weaponry operating via space to knock out Soviet ICBMs almost immediately after launch. A total defense system could be half a century away, but the Defense Department already is planning to spend at least $26 billion through fiscal 1989 on the program for research, development, and demonstration. On top of that, the Air Force last month conducted the initial test of an antisatellite (ASAT) missile launched from an F-15 fighter.

The Soviets, of course, for a decade have been working with mixed success on an ASAT system of their own. And they are exploring directed energy beam technologies for possible use in ASAT systems and for ballistic missile defense. Robert Cooper, director of the Defense Department's Advanced Research Projects Agency, says, "The Soviets could launch the first prototype of a space-based laser antisatellite weapon in the late 1980s or early 1990s. An operational system capable of attacking other satellites within a few thousand kilometers range could be possible in the 1990s."

But critics say that the militarization of space means that events are set in motion now that disturb the delicate global command, control, and communications system that both sides use to achieve stability, to check one another. The so-called Star Wars development poses conceptual and legal problems not fully explored by its advocates. In aiming to control the high ground, the superpowers are in effect transporting the animosities that rule on Earth into outer space. Thus, instead of space fulfilling the dream of uniting countries to a single purpose of exploration and human development, space could divide them even more.

The trend, to many who have viewed the space program over the years, is tragic. Says Burroughs Corp.'s Frutkin, "The steady increase in the militarization of space is worrisome. A drift that began principally in President Carter's day, it has been abetted by a conclusion on the part of some senior NASA officials in the past half-dozen years that the very future of NASA programs—laid low by annual budgeting stretchouts—depends upon a new alliance with the Pentagon.

"The policy of deliberate cold war rhetoric may have its rationale in the projection of resolve and readiness to the other side to reduce the chances of miscalculation, but it may just as well provoke miscalculation. And apart from this, it is difficult to discern any coherent national space policy on the current scene."

Has the Star Wars strategy really been carefully thought out? Many say no. One critic is Robert Bowman, a former Air Force colonel who is now head of his own Institute for Space & Security Studies in Potomac, Md. Bowman says antisatellite and anti-ICBM weaponry will destabilize the international security system if allowed to continue. Bowman can claim the right credentials, for his last job in the Air Force was director of advanced space programs development in the Air Force space division. He left the military for private industry in 1978 but by 1982 found he had

even less freedom to criticize there than in the service. So he left to form his institute.

His thinking, in a nutshell, goes something like this: Most strategic thinkers in the Air Force believe that the present technological system of maintaining global stability is the optimal setup. It is the latest in high technology and performs at the state of the art. These satellites are always monitoring military activities and both sides have them. They do such things as locate and monitor targets, define order of battle, monitor and assess crisis situations anywhere on Earth, provide geodetic information for ICBM targeting, and constantly map strategic regions around the globe.

In fact, Bowman says, the U.S. system is so good that it would be impossible for the Soviet Union to launch a surprise attack on the U.S. "Our B-52s would be off the ground before anything would hit," he says.

"President Reagan is sincere, but he's been sold a bill of goods. Some of the people who formulated the current policy want Star Wars for one reason: It is a necessary ingredient for first-strike capability. They see stability as us having the overwhelming edge." And with that edge, Bowman adds, the U.S. could then pressure the Soviets to abandon their policies and their political and military occupations of other countries—something futile and dangerous to expect.

"I don't see how the Soviets could see us developing first-strike capability," says a White House official who asked to be unnamed. "That's a long way down the road. And as we gain confidence in something reliable and definable, we should sit down and think about rational ways out of this question.

"I could see a defensive system in space producing a stable world where both sides have deterrence without fear of nuclear annihilation. These defensive systems will be expensive. But what we spend for the defensive systems could be less than the Triad (the current combination of ballistic missiles fired from land sites, submarines, and aircraft). In the political sense, the American people would be much more willing to support defensive systems than offensive systems carrying weapons."

The official thinks that opposition to Reagan's plan comes from those with vested interests in status quo deterrence thinking. That is, many analysts and strategists have devoted their careers to the technology and policy of conventional nuclear deterrence. He believes it is this thinking that produces instability. "Overnight they are asked to give thought to a whole fundamental change in a way of thinking. That's why they were so surprised by it.

"We are frontier people," he adds. "What more worthy goal is there if you want to devote your life to something that promises to eventually do away with nuclear weapons? But you have to increase investment, bring strong management and leadership to the technology associated with this capability. And we have to be sure to develop friends and advisers to allay fears that we aren't going to develop first-strike capability. These are things that lie ahead. We don't have easy answers. The President feels that the payoff is of such enormous potential that it will be worth the time and expense."

The subject is vast in its scope. The point, though, is that space does signify power for both stability and instability. Politics of the future will have to be deft and imaginative, with the concerns of the entire Earth in mind.

"Space technology," says Victor Reis of Science Applications Inc., McLean, Va., "does involve a lot of opinions and does represent frontiers of interaction with the rest of the world," he says. "In fact, I'm trying to sort those things out."

Reis' last job was in space policy for the White House Office of Science & Technology Policy. He was one of those taken by surprise by President Reagan's Star Wars speech of March 23. Up to then, he and science adviser George A. Keyworth II were minimizing the feasibility of the laser, particle beam, and x-ray weaponry. Without warning, Reis was suddenly faced with arguing in favor of something he didn't fully believe in.

Reis sees some idealistic promise in NASA's Earth systems science program and serves on a planning committee for it. That program is a followup to NASA's global habitability program, whose name the White House disliked because of the socialistic implications of the word global. When the Earth systems science program gets started, it will involve other agencies and other countries, including the United Nations Environmental Program, in its goal of studying Earth as a complete system to assess more clearly the threats to it. Even the Soviet Union would be included. Says Reis: "If it's a real good program, and if it is global, how could we not involve the Russians?"

And the globe also includes the developing countries, many of which are an annoyance to the U.S. by their hostility at the United Nations. But developing countries now see space technology as necessary for their economic and social development. And they have a couple of worries in this heavily technological world. The first is that since the technology of the industrial countries is the equivalent of global political and economic power, the developing countries deal in space policy from an empty hand. They have no space agency, they have no space development bank.

They have one political forum, the UN. But that is little help for them in establishing a dialogue with the U.S., because to the U.S. the UN is simply a cabal of countries hostile to the interests of America. Not one of the key subcommittees of the UN's Committee on the Peaceful Uses of Outer Space has a U.S. member.

"We are troubled by being excluded from positions in the UN Outer Space Committee," says Otho Eskin, director of the State Department's office of advanced technology. "We hate to see a committee that has been fruitful become just another arena in which the U.S. gets kicked around. So we are examining our whole participation in the committee. In the meantime, we are not going to be very active in it." This summer the committee will be discussing the new proposed Soviet treaty banning all weapons from space. But Eskin says the U.S. will merely observe the debate,

Space science's uneasy relation to space hardware

Academic space scientists are not entirely happy with NASA's treatment of their many fields, from astrophysics to geochemistry. They complain that fields like planetary exploration all play second fiddle to the shuttle program. Every extra $50 million spent on the shuttle to cover cost overruns or unexpected repair bills means another $50 million lost on committed projects like the space telescope or the Jupiter mission called Galileo. Former NASA chief scientist John Naugle, now a vice president at Fairchild Industries, says the 10- to 15-year time gap between new missions is now too great.

"We cannot maintain our scientific leadership in an emerging active discipline such as x-ray astronomy by flying an Einstein Observatory in 1978 and then waiting 13 years until 1991 to follow up the discoveries with the Advanced X-Ray Astrophysics Facility."

But the maturation of the space shuttle program, growing from three shuttle vehicles today to five within the decade should help because the shuttle will be able to place new satellites into orbit and service existing ones routinely.

This year the shuttle will carry Spacelab aloft again in November for another set of experiments. But only one other new scientific mission will take place, that of the active magnetospheric particle trace explorer in August. Two new initiatives, however, were included in the fiscal 1985 budget, an upper atmospheric research satellite and a Mars geoscience/climatology orbiter, slated for launch in 1990.

Instrumentation development is continuing for what would, for the first time, "make a comprehensive global measurement of the stratosphere," according to NASA Administrator James M. Beggs. "This budget will enable us to begin to develop the upper atmospheric research satellite that will place these instruments in orbit."

NASA's proposed budget for space science in fiscal 1985

$ Millions	
PHYSICS AND ASTRONOMY	**$ 677.2**
Space telescope development	195.0
Gamma ray observatory development	120.2
Shuttle/Spacelab payload development	105.4
Explorer development	51.9
Mission operations, data analysis	109.1
Research and analysis	36.9
Suborbital program	58.7
LIFE SCIENCES	**63.3**
Flight experiments	27.1
Research and analysis	36.2
PLANETARY EXPLORATION	**286.9**
Galileo project development	56.1
Venus radar mapper mission	92.5
International solar polar mission	9.0
Mars orbiter	16.0
Mission operations, data analysis	58.8
Research and analysis	54.5
SPACE APPLICATIONS	**344.1**
Solid Earth observations	
Shuttle/Spacelab payloads	18.1
Geodynamics	29.9
Research and analysis	15.6
Environmental observations	
Upper atmosphere research	31.0
Atmospheric dynamics and radiation research	28.5
Oceanic processes research	19.4
Space physics research	16.7
Shuttle/Spacelab payload development	7.8
Earth radiation budget experiment	8.1
Extended mission operations	29.5
Interdisciplinary research	1.0
Tethered satellite payloads	3.0
Scatterometer	15.0
Upper atmosphere research satellite mission	60.7
Materials processing in space	23.0
Communications	20.6
Information systems	16.2
TOTAL	**$1371.5**

holding that such discussion should take place in the Committee on Disarmament.

Space policy has its international security theme setters, but none has been so dogged over the years as Howard Kurtz, former airline executive and retired Air Force lieutenant colonel who heads War Control Planners in Washington, D.C. Kurtz qualifies for the role as space evangelist.

Kurtz believes that all the two superpowers really are doing is preserving a high-technology arms race, that they continue to escalate it and thus endanger the world through a simple paranoiac need to control power. The monopoly has gone far enough, Kurtz believes, and it is time for an international organization to harness space technology in a campaign for global security.

Rep. George E. Brown Jr. (D.-Calif.) is in sympathy with Kurtz but says Kurtz is "25 years ahead of his time." Nevertheless, Kurtz has managed to convince enough people in official positions that the UN has adopted a proposal to establish what is called an International Satellite Monitoring Agency. This agency over the years would not only operate a string of global resource satellites for enhancing social and economic development but form a third security force that through reconnaissance satellites would observe the military activities of the two superpowers.

Kurtz had an ally in the UN's deputy secretary-general Robert Muller, who took the idea to then French Prime Minister Valéry Giscard d'Estaing, who, in turn, proposed it to the UN. Last summer, the UN published a report outlining the technical, legal, and financial implications of the whole idea.

The UN General Assembly is expected to discuss steps—whether by treaty or convention—by which such an agency could come into being. The U.S. and U.S.S.R. have united in opposition to the idea and so it doesn't look like the proposed agency will go anywhere, since neither wants a third power spying on it.

Another space/security theorist is Daniel Deudney of Worldwatch Institute. Worldwatch is one of those

Space effort involves more than 20 major U.S. installations

NASA (1)

1. **Goddard Space Flight Center,** Greenbelt, Md.
2. **Wallops Island Space Flight Facility,** Chincoteague, Va.
3. **Johnson Space Center,** Houston
4. **Kennedy Space Center,** Cape Canaveral, Fla.
5. **Marshall Space Flight Center,** Huntsville, Ala.
6. **National Space Technology Laboratories,** Bay Saint Louis, Miss.
7. **Langley Research Center,** Hampton, Va.
8. **Lewis Research Center,** Cleveland
9. **Jet Propulsion Laboratory,** California Institute of Technology, Pasadena

Air Force (10)

10. **Western Space & Missile Center,** Vandenberg Air Force Base, Calif.
11. **Air Force Space Command & Consolidated Space Operations Center,** Colorado Springs, Colo.
12. **Air Force Space Technology Center,** Kirtland Air Force Base, Albuquerque, N.M.
13. **Air Force Space Division,** Los Angeles
14. **Rocket Propulsion Laboratory,** Edwards Air Force Base, Calif.
15. **Eastern Space & Missile Center,** Cape Canaveral, Fla.
16. **Air Force Systems Command,** Washington, D.C.
17. **Air Force Geophysics Laboratory,** Hanscomb Air Force Base, Bedford, Mass.
18. **Satellite Control Center,** Sunnyvale, Calif.

Navy (19)

19. **Naval Space Command,** Dahlgren, Va.
20. **Naval Astronautics Group,** Pt. Mugu, Calif.
21. **Naval Telecommunications Command,** Washington, D.C.

whole-Earth think tanks not in very high repute in the Reagan Administration's Washington. Deudney even thinks the industrialization of space is dangerous to global security.

"The first strategy of industrializing near space," wrote Deudney in the recent winter issue of *Foreign Policy*, "has an inescapable military dimension and contains the seeds of planetary tyranny. The difference between civilian function and military capability has always been small in space—and it will all but disappear with the advent of large-scale space ventures such as solar-powered satellites, space colonies, and asteroid mining.

"Solar-powered satellites, first conceived for military purposes, may generate enough power to turn particle-beam and laser systems into viable weapons. And lunar or asteroidal mass accelerators—the slingshotlike devices to turn construction material into orbit that many large-scale space industrialization schemes are based on—have a powerful destructive potential. Such slingshots would make all points on Earth vulnerable.

"Controlling the military potential of these technologies will be virtually impossible if the industrialization of space occurs in an environment of military competition. The fundamental danger of large-scale space ventures rests on one inescapable geopolitical fact: Effective control of outer space means effective control of the planet. Should this high ground be garrisoned or colonized, a high, impregnable castle will have been created."

So much for the strategists. What do chemists have to say? One who offers quick and weighty comments is George C. Pimentel, director of the laboratory of chemical biodynamics at Lawrence Berkeley Laboratory, professor of chemistry at the University of California, Berkeley, and former deputy director of the National Science Foundation. Pimentel is chairman of the National Academy of Sciences' Committee to Survey Opportunities in the Chemical Sciences, whose report is due out later this year. He was involved in space development of the infrared spectroscopy instrumentation for the Mariner 6 and 7 missions to Mars. He also was nearly chosen as a scientist-astronaut.

"I think we have exactly the same debate about to take place today as we had during the 1950s," he says, "when the control of atomic energy was debated, that is, whether society controls its own destiny. I always felt that nuclear power was so important that it had to be under civilian control and the debate kept in the open.

"The issues being argued over with regard to space are even more significant. They are still being argued in terms of the problems of humankind and human conflict. Developments now are moving so fast that we cannot stop them. Great feats in space can be carried out without thought to the ultimate security of the people below.

"So the question is what direction one might go with any chance of reversing the process. The only thing I can see is to leapfrog the whole question of the space station and make a decision to colonize the moon through a wholly international effort. The tangible effect would be to show how we can go ahead and explore space immediately. This would get us into interaction with potential adversaries and change directions in a most favorable way. You grope so hard these days for any ray of hope that promises to diminish rather than increase the adversarial roles of countries." □

Chemical Earnings Almost Doubled in Fourth Quarter

William J. Storck, C&EN New York

The fourth quarter was one of surprises for many chemical industry observers. They expected earnings to show a healthy rise over the same period the year before, but what they got exceeded even their wildest expectations.

Earnings for basic chemical companies, instead of rising the 50% or so expected, actually rose 95% over fourth-quarter 1982, according to C&EN's latest survey of major companies. Diversified companies and oil firms that manufacture chemicals also showed earnings rises, but companies whose main business is chemicals were the stellar performers.

In fact, the fourth quarter saved the year for chemical companies, enabling them to show a full-year increase. Earnings had to rise more than 50% in the fourth quarter for the industry to break even for the year. The actual 95% increase pushed up full-year earnings 6% over 1982.

Because of the momentum gained in the fourth quarter by chemical companies, good earnings growth will be a certainty in first-half 1984. Helping the year-to-year comparisons will be weak earnings in first-half 1983.

However, the chemical industry may well have to make its gains mostly on production and operating efficiencies as it did in the second half of 1983. Industry sources say that prices still are not moving up the way that they had hoped. The 2.2% increase in the government's producer price index for chemicals and allied products during the fourth quarter of 1983 is the highest since the second quarter of 1982. And it is only the second year-

Chemical industry leaders for fourth-quarter. . .

Sales

Rank		$ Millions	Rank 1982
1	Dow Chemical	$2923.0	1
2	Union Carbide	2350.0	2
3	W. R. Grace	1753.7	3
4	Monsanto	1651.0	4
5	PPG Industries	963.7	6
6	American Cyanamid	923.3	5
7	Celanese	850.0	7
8	National Distillers	706.5	9
9	Hercules	644.0	8
10	Olin	484.9	11

Earnings[a]

	$ Millions	Rank 1982
Dow Chemical	$83.4	15
Monsanto	78.0	8
PPG Industries	67.9	2
Union Carbide	58.9	5
W. R. Grace	58.0	1
American Cyanamid	55.2	3
Celanese	52.0	30
Morton Thiokol	44.0	4
Hercules	42.6	6
Air Products	34.0	11

Profitability

	Earnings as % of sales	Rank 1982
International Minerals	11.9%	2
Freeport-McMoRan	11.4	1
Loctite	10.6	5
Nalco Chemical	10.3	2
Morton Thiokol	9.6	4
International Minerals	8.5	8
Air Products	8.2	10
Rohm & Haas	7.5	16
Pennwalt	7.3	26
Ethyl	7.2	7

. . . and for full-year 1983

Sales

Rank		$ Millions	Rank 1982
1	Dow Chemical	$10951.0	1
2	Union Carbide	9000.0	2
3	Monsanto	6299.0	3
4	W. R. Grace	6219.5	4
5	PPG Industries	3700.0	6
6	American Cyanamid	3535.5	5
7	Celanese	3261.0	7
8	Hercules	2629.0	8
9	National Distillers	2588.9	9
10	Olin	1934.6	11

Earnings[a]

	$ Millions	Rank 1982
Monsanto	$388.0	2
Dow Chemical	273.0	1
Union Carbide	249.1	3
PPG Industries	232.5	5
American Cyanamid	166.4	6
W. R. Grace	159.7	4
Hercules	150.2	8
Rohm & Haas	141.5	13
Celanese	119.0	25
Air Products	116.9	9

Profitability

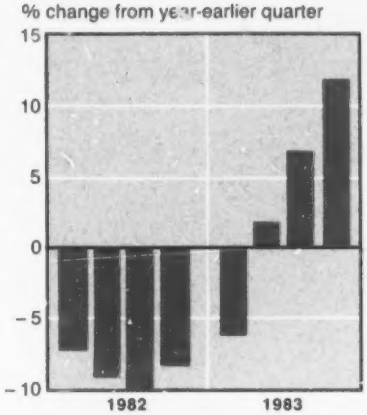
	Earnings as % of sales	Rank 1982
International Flavors	14.8%	1
Freeport-McMoRan	11.5	2
Nalco Chemical	10.8	3
Loctite	9.7	6
Petrolite	7.7	4
Rohm & Haas	7.5	18
Air Products	7.0	8
Chemed	6.4	7
Ethyl	6.4	10
PPG Industries	6.3	13

a After taxes. **Note:** For 30 companies listed on page 20.

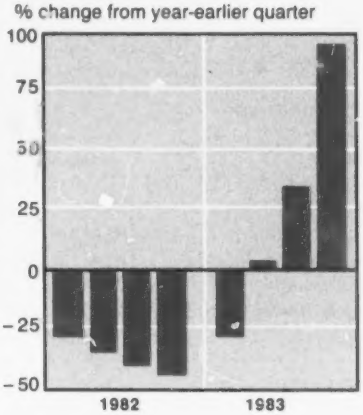
Chemical industry 1983 fourth-quarter results

- Sales were up 12%
- Earnings nearly doubled
- Profit margin rose to 4.8%
- Production climbed 17%
- Prices rose only 2%

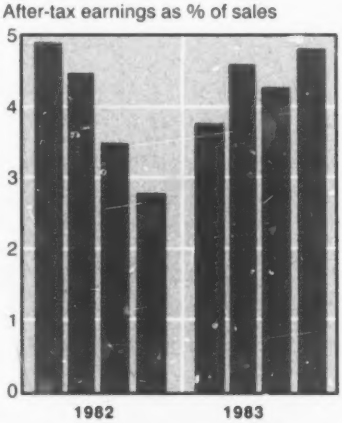
Sales
% change from year-earlier quarter



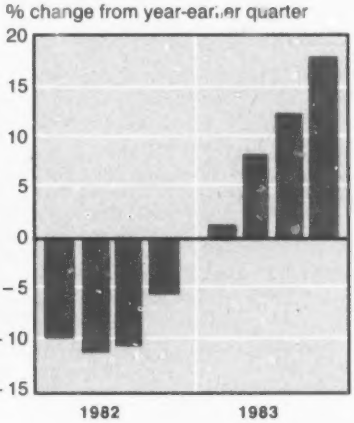
Earnings
% change from year-earlier quarter



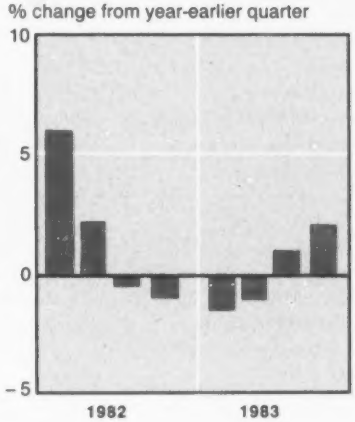
Profit margins
After-tax earnings as % of sales



Production
% change from year-earlier quarter

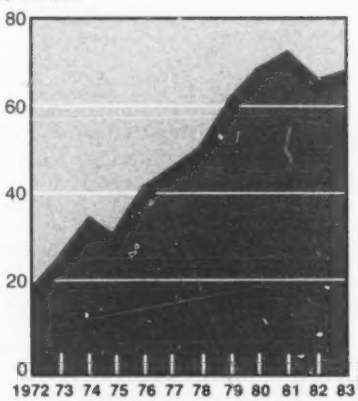


Prices
% change from year-earlier quarter

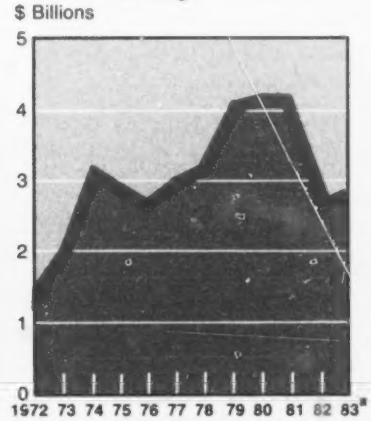


Sales for 1983 were up 3%, and earnings climbed 6% to raise profitability to 4.3%

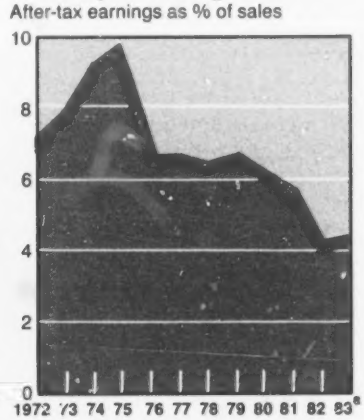
Annual sales
$ Billions



Annual earnings
$ Billions



Annual profit margins
After-tax earnings as % of sales



a C&EN estimates. **Note:** All sales, earnings, and profit-margin data are based on the combined results of the 30 companies listed on page 20.

Chemical earnings were up almost 100% in fourth quarter; sales rose 12%

	FOURTH-QUARTER 1983						FULL-YEAR 1983					
	Sales ($ millions)	Earnings[a] ($ millions)	Change from 1982 Sales	Change from 1982 Earnings	Profit margin 1983	Profit margin 1982	Sales ($ millions)	Earnings[a] ($ millions)	Change from 1982 Sales	Change from 1982 Earnings	Profit margin 1983	Profit margin 1982
Air Products	$ 415.9	$ 34.0	8%	75%	8.2%	5.0%	$ 1,662.0	$ 116.9	5%	17%	7.0%	6.3%
American Cyanamid	923.3	55.2	9	42	6.0	4.6	3,535.5	166.4	2	26	4.7	3.8
Celanese	850.0	52.0	20	def	6.1	def	3,261.0	119.0	6	2280	3.6	0.2
Chemed	78.5	4.0	31	43	5.1	4.7	271.3	17.4	ə	ə	6.4	6.4
Crompton & Knowles	59.0	1.7	16	−32	2.9	4.9	230.6	6.3	8	21	2.7	2.4
Dow Chemical	2,923.0	83.4	14	542	2.9	0.5	10,951.0	273.0	3	−20	2.5	3.2
Ethyl	452.0	32.4	18	24	7.2	6.8	1,745.2	111.8	8	19	6.4	5.8
First Mississippi	54.3	1.9	25	−37	3.5	6.9	222.3	8.8	8	−31	4.0	6.2
Freeport-McMoRan	201.0	23.0	5	8	11.4	11.1	786.2	90.1	5	7	11.5	11.2
H. B. Fuller	110.0	4.1	14	105	3.7	2.1	425.5	13.8	28	60	3.2	2.6
W. R. Grace	1,753.7	58.0	11	7	3.3	3.4	6,219.5	159.7	2	−37	2.6	4.2
Hercules	644.0	42.6	4	61	6.6	4.3	2,629.0	150.2	0	46	5.7	3.9
International Flavors	97.6	11.6	3	22	11.9	10.0	460.9	68.4	3	8	14.8	14.1
International Minerals	356.7	30.3	10	40	8.5	6.7	1,492.7	84.5	−1	14	5.7	4.9
Loctite	56.6	6.0	13	71	10.6	7.0	228.2	22.2	7	63	9.7	6.4
Lubrizol	na	na	na	na	na	3.5	na	na	na	na	na	5.9
Monsanto	1,651.0	78.0	13	225	4.7	1.6	6,299.0	388.0	0	14	6.2	5.4
Morton Thiokol[b]	458.4	44.0	8	25	9.6	8.3	1,829.1	98.0	77	82	5.4	5.2
Nalco Chemical	170.1	17.5	7	17	10.3	9.4	659.4	71.0	2	10	10.8	10.0
National Distillers	706.5	29.8	56	73	4.2	3.8	2,588.9	66.7	41	−16	2.6	4.3
Olin	484.9	12.2	17	97	2.5	1.5	1,934.6	71.7	6	14	3.7	3.4
Pennwalt	245.0	17.9	12	44,650	7.3	0.0	976.7	44.8	3	83	4.6	2.6
Petrolite	71.5	4.8	0	−28	6.7	9.4	287.9	22.1	−5	−25	7.7	9.7
PPG Industries	963.7	67.9	17	63	7.0	5.1	3,700.0	232.5	12	50	6.3	4.7
Reichhold Chemicals	179.3	5.4	1	800	3.0	0.3	747.3	20.1	−5	310	2.7	0.6
Rohm & Haas	433.8	32.6	13	131	7.5	3.7	1,875.9	141.5	3	88	7.5	4.1
Stauffer Chemical	385.0	19.1	−3	355	5.0	1.1	1,326.2	−1.4	−18	def	def	7.3
Union Carbide	2,350.0	58.9	3	95	2.5	1.3	9,000.0	249.1	−1	−20	2.8	3.4
Williams Cos.	na	na	na	na	na	1.4	na	na	na	na	na	1.8
Witco Chemical	361.3	15.1	19	96	4.2	2.5	1,385.7	52.0	6	84	3.8	2.2
Total largest 14 firms[c,d]	**$15,010.2**	**$681.0**	**13%**	**106%**	**4.5%**	**2.5%**	**$55,401.6**	**$2246.5**	**4%**	**9%**	**4.1%**	**3.9%**
Total other 14 firms[c]	**$ 2,425.9**	**$162.4**	**8%**	**62%**	**6.7%**	**4.5%**	**$ 9,500.9**	**$ 520.1**	**0%**	**−5%**	**5.5%**	**5.7%**
GRAND TOTAL[d]	**$17,436.1**	**$843.4**	**12%**	**95%**	**4.8%**	**2.8%**	**$64,902.5**	**$2766.6**	**3%**	**6%**	**4.3%**	**4.1%**

a After-tax income from continuing operations excluding extraordinary and nonrecurring items. b Morton Thiokol's full-year data not comparable. c Division between large and small companies is about $400 million in sales in fourth-quarter 1983. d Totals, per cent change, and profit margin averages for full year exclude Morton Thiokol. na = not available. def = deficit.

to-year increase since that quarter. In the third quarter of 1983 the producer price index was up 1.1%.

Olin's chairman and chief executive officer John M. Henske said, "While the consumer is leading the economy out of its doldrums, there is still some slack in the industrial side, which has made it difficult to get adequate pricing for some of our key products, such as chlorine and caustic soda. During 1983, Olin's overall price index was slightly negative." Henske does not expect the situation to improve until late 1984.

However, during the fourth quarter, production of chemicals and products as reported by the Federal Reserve Board increased 17% from the same period of 1982. This increase in production, combined with the operating efficiencies and cost containment programs put in place by the chemical industry over the past few years, has given chemical companies tremendous earnings leverage. In other words, chemical breakeven points have been lowered enough that even a small increase in the production index translates into a sizable rise in earnings.

A number of chemical company executives commented on this when releasing fourth-quarter results. John D. Macomber, chairman of Celanese, said, "We benefited from our stringent cost control programs of the past two years and our operating margins have increased. We continue to strive for greater efficiency and effectiveness throughout the corporation."

At Pennwalt, chairman Edwin E. Tuttle said, "The combination of improved business conditions and the operating efficiencies we have been able to implement is now resulting

in better earnings for an increasing number of the company's profit centers. This is especially true for specialty chemicals."

And Edward G. Jefferson, Du Pont's chairman, said, "Earnings were well ahead of 1982 as the company benefited substantially both from improvements in the economy and from the effects of ongoing cost reduction and productivity improvement programs."

In the fourth quarter, the 95% increase moved combined earnings for 28 of the chemical companies that thus far have reported earnings up to about $843 million. Combined sales for these companies rose 12% to $17.4 billion.

Profitability was much improved over a year before. Profit margins for the chemical firms climbed to an average of 4.8% from 2.8% in the final three months of the year before.

In terms of growth the larger companies on the list by far surpassed the smaller companies. Sales of the 14 larger companies in fourth-quarter 1983 were up 13% from a year earlier to $15.0 billion. Earnings for this group, however, surged 106% to $681 million.

For the 14 smaller companies, fourth-quarter sales totaled $2.4 billion, an 8% increase from the same period of 1982. And earnings increased 62% to $162 million.

The smaller companies still lead the larger ones in profitability, although profitability increased at both. For the 14 larger firms, the average profit margin increased to 4.5% in 1983's fourth quarter from 2.5% the year before; at the 14 smaller companies, the average profit margin climbed to 6.7% in the final quarter of 1983 from 4.5% in the fourth quarter of 1982.

The 95% gain in earnings in the fourth quarter was on earnings from operations excluding nonrecurring items and extraordinaries. These two areas hurt chemical company results as firms took writedowns of less profitable operations and had to contend with some other unusual financial problems. If the extraordinary and nonrecurring items were left in, earnings would have been up 69% instead of 95%. Thus, it can be said that, as usual, companies

C&EN staff photo

Jefferson: earnings well ahead of 1982

took advantage of the fourth quarter—and in this case of a good fourth quarter—to shuck off unwanted operations. A number of companies, including Dow Chemical, Union Carbide, and, of the diversified firms, Allied, took large write-offs in last year's fourth quarter.

For the full year, the massive gains in the fourth quarter raised chemical company earnings to the plus side. Earnings for 27 of the 28 companies increased 6% from 1982 to a total of $2.77 billion. (These results exclude Morton Thiokol, whose year-to-year data for the 12 months are not comparable.) Combined sales, however, rose only 3% to $64.9 billion, again showing the earnings leverage of improved operations.

Mahoney: ag business finished strong

Earnings for 13 of the 14 larger companies (again excluding Morton Thiokol) increased 9% from a year before to a combined $7.25 billion. This was on a sales increase of 4% to $55.4 billion.

As with the quarterly results, this was better than the results from the smaller, more specialized firms. Combined earnings at these 14 companies fell 5% to $520 million, and sales were essentially unchanged from 1982 at $9.50 billion.

Thus, full-year profitability for the larger companies increased from 1982 but fell for the smaller firms. Profit margins for the 13 larger companies averaged 4.1%, up from 3.9% in 1982. At the smaller companies, profit margins fell to an average 5.5% from 5.7% the year before. For the 27 companies, total return on sales was up two percentage points in 1983 to 4.3% from 4.1% in 1982.

The improvement in fourth-quarter earnings was led by increased demand in a number of chemical sectors, but chief among these was plastics, as it was in the third quarter. At Dow Chemical, Robert M. Keil, executive vice president and chief financial officer, said of earnings, "The improvement was led by our plastics business. Dowlex linear low-density polyethylene recorded its fifth consecutive year of significant volume growth, and polystyrene showed substantial improvement over last year's difficult market conditions."

At Monsanto, despite nonrecurring charges, fourth-quarter operating income in its polymer products unit increased 64% from a year earlier to $18 million. For the full year, Monsanto's operating income from polymer products rose 287% to $89 million.

And at Du Pont, after-tax operating income from polymer products increased 227% in the fourth quarter to $72 million. For full-year 1983, income from polymer products gained 167% to $208 million.

Allied credits both plastics and fibers for helpings its chemical operations. The company says that

Energy earnings up slightly despite sales decline; diversified earnings climb faster

	% chemical Sales	FOURTH-QUARTER 1983 Sales ($ millions)	Earnings[a]	Change from 1982 Sales	Earnings	Profit margin 1983	1982	FULL-YEAR 1983 Sales ($ millions)	Earnings[a]	Change from 1982 Sales	Earnings	Profit margin 1983	1982
OIL AND GAS COMPANIES													
American Petrofina	11	$ 505.0	$ 23.4	−5%	58%	4.6%	2.8%	$ 2,088.5	$ 55.3	−7%	2%	2.6%	2.4%
Atlantic Richfield	8	6,716.6	419.0	−5	−3	6.2	6.1	25,937.4	1547.9	−4	−8	6.0	6.2
Exxon	7	24,663.0	1625.0	−7	10	6.6	5.6	94,591.0	4985.0	−9	19	5.3	4.0
Getty Oil	2	3,050.9	238.9	1	38	7.8	5.7	12,016.0	744.3	−3	8	6.2	5.6
Gulf Oil	7	7,486.0	229.0	−8	24	3.1	2.3	28,887.0	831.0	−6	8	2.9	2.5
Internorth	8	1,593.2	91.2	34	196	5.7	2.6	4,997.0	255.4	20	41	5.1	4.4
Kerr-McGee	13	923.3	17.1	−9	−77	1.9	7.2	3,507.7	118.4	−7	−44	3.4	5.6
Mobil	4	15,578.0	445.0	−6	12	2.9	2.4	58,515.0	1501.0	−9	24	2.6	1.9
Occidental Petroleum	na	4,701.9	292.0	−1	def	6.2	def	19,115.7	480.2	8	252	2.5	0.8
Phillips Petroleum	15	4,150.0	211.0	2	1	5.1	5.1	15,470.0	1.0	−3	0	0.0	0.0
Shell Oil	15	5,245.0	549.0	1	25	10.5	8.5	19,883.0	1633.0	−2	2	8.2	7.9
Standard Oil of California	3	7,441.0	403.0	−6	−5	5.4	5.4	29,182.0	1590.0	−19	15	5.4	3.8
Standard Oil (Ind.)	9	7,400.0	459.0	0	11	6.2	5.6	29,500.0	1868.0	−1	2	6.3	6.1
Standard Oil (Ohio)	4	3,205.0	434.0	0	−6	13.5	14.4	12,067.0	1854.0	−11	−1	15.4	13.9
Sun Co.	3	4,230.0	144.0	3	0	3.4	3.5	15,520.0	523.0	−5	0	3.4	3.2
Tenneco	7	3,841.0	241.0	−1	−13	6.3	7.1	14,449.0	716.0	−4	−15	5.0	5.6
Texaco	3	10,500.0	204.0	−10	−59	1.9	4.2	41,100.0	1129.0	−14	45	2.7	1.6
Unocal (Union Oil)	11	2,680.0	178.0	−2	−21	6.6	8.2	10,690.0	626.0	−2	−22	5.9	7.4
DIVERSIFIED MANUFACTURERS													
Allied	25	2,488.0	118.0	14	174	4.7	2.0	10,022.0	450.0	67	28	4.5	5.9
Aluminum Co. of America	11	1,469.7	75.2	39	81	5.1	3.9	5,263.4	105.3	13	def	2.0	def
Beatrice Foods	5	2,475.6	116.0	7	37	4.7	3.7	9,441.5	358.1	−7	14	3.8	3.1
Borden	30	1,168.9	52.5	8	23	4.5	3.9	4,264.8	160.4	4	16	3.8	3.4
Diamond Shamrock	31	1,177.8	−130.0	56	def	def	6.1	4,026.1	−60.2	27	def	def	4.7
Du Pont	33	9,100.0	331.0	8	61	3.6	2.5	35,400.0	1067.0	6	28	3.0	2.5
Eastman Kodak	20	2,572.0	117.0	−15	−63	4.5	10.6	10,170.0	565.0	−6	−51	5.6	10.7
Engelhard	12	473.8	20.3	−21	18	4.3	2.9	2,099.3	73.5	4	13	3.5	3.2
FMC	38	924.6	68.6	4	22	7.4	6.4	3,498.2	180.9	0	10	5.2	4.7
General Electric	4	7,430.0	579.0	0	10	7.8	7.0	26,800.0	2024.0	1	11	7.6	6.9
Georgia-Pacific	12	1,642.0	104.0	20	447	6.3	1.4	6,469.0	261.0	20	4250	4.0	0.1
Kaiser Aluminum	22	805.2	−0.3	21	def	def	def	2,857.6	−152.7	−2	def	def	def
Koppers	34	447.0	8.8	18	def	2.0	def	1,565.7	24.6	−1	def	1.6	def
Eli Lilly	27	753.1	115.4	5	16	15.3	13.8	3,033.7	457.4	2	7	15.1	14.4
3M	15	1,756.0	163.0	13	8	9.3	9.7	7,039.0	667.0	7	6	9.5	9.6
Merck	21	855.8	104.8	8	5	12.2	12.6	3,246.1	450.9	6	9	13.9	13.6
NL Industries	35	390.1	1.5	−3	−93	0.4	5.3	1,390.1	−18.8	−35	def	def	10.3
Northwest Industries	20	443.5	4.7	35	−29	1.1	2.0	1,608.1	9.6	−19	−95	0.6	9.3
Pfizer	11	972.9	119.2	12	28	12.3	10.7	3,750.0	447.1	7	33	11.9	9.6
Tyler	35	271.7	4.9	25	96	1.8	1.2	960.9	18.4	10	80	1.9	1.2
Uniroyal	27	534.9	15.4	14	def	2.9	def	2,040.3	52.3	4	104	2.6	1.3
Upjohn	17	505.3	33.8	9	37	6.7	5.3	1,986.0	160.2	9	27	8.1	6.9
U.S. Steel	6	4,707.0	166.0	10	def	3.5	def	17,523.0	−12.0	−7	def	def	def
Vulcan Materials	29	232.2	28.3	37	201	12.2	5.6	820.5	54.2	14	−1	6.6	7.6

a From continuing operations excluding extraordinary and nonrecurring items. **def** = deficit. **na** = not available.

in the fourth quarter, income from the chemical segment was substantially higher than in 1982's fourth quarter, reflecting very strong earnings from home furnishing fibers, apparel fibers, high-density polyethylene, engineered plastics, and fluorine products.

Firms whose fibers operations were suffering in fourth-quarter 1982 generally performed very well in the last three months of 1983. Monsanto, for example, swung from a $7 million deficit in fourth-quarter 1982 to a gain of $14 million in its fibers and intermediates unit in fourth-quarter 1983. And Celanese's net income on fibers operations rose 88% during the same period to $1.56 per share.

Also making something of a comeback at a number of companies after a poor year brought on by the government's farm policies were agricultural chemicals—both fertilizers and pesticides. In fertilizers, International Minerals & Chemical says that shipments of potash and phosphate chemicals were strong in the fourth quarter. Phosphate chemical shipments were up 26% from a year earlier and potash shipments increased 44%.

Stauffer Chemical says its agricultural chemical sales for the quarter were encouraging and better than expected, given its new marketing program that will shift the majority of the 1984 season agricultural sales to the January-to-June period. The company is expecting a return to more normal corn planting and stronger demand for its herbicides this spring.

Monsanto says it achieved substantially improved market position during 1983 for its crop chemicals "despite the government's payment-in-kind program." Company president Richard J. Mahoney said, "Our agricultural business finished the year with a strong fourth quarter, reflecting expectations for a good 1984 crop year." Monsanto's fourth-quarter income from agricultural products increased 117% from a year earlier to $78 million. However, income from the same unit for the full year declined 12% from 1982 to $375 million.

The improvement in agricultural earnings may well complete the scene for much better earnings in the first half of 1984. Ag chemicals were practically the last chemical operations to fall into place in the recovery, thanks to the government's policies. The improved outlook for pesticides may well mean that most, if not all, markets for chemicals will see a better first six months in 1984. In fact, considering the weakness of 1983's first half, earnings gains comparable with those of fourth-quarter 1983 are not out of the question. □

Oil companies' chemical earnings solidly in the black

Chemical results at major U.S. oil and gas companies at last have become profitable, both for the quarter and the year. In the fourth quarter of 1982, all but one of eight major oil companies surveyed by C&EN posted a loss in its chemical operations. The one profitable company was Exxon. In 1983's fourth quarter, however, all but two of the firms—Gulf Oil and Texaco— once again were in the black. The eight firms report net earnings from chemical operations on a consistent basis.

For the full year, these same two firms reported losses in chemical operations, whereas in 1982 for the full year, three companies—Atlantic Richfield, Gulf, and Shell, had losing chemical operations.

The eight oil and gas firms reported total chemical earnings in the fourth quarter of about $203 million, up from a loss for the eight in fourth-quarter 1982 of almost $172 million.

For full-year 1983, earnings for the group totaled $457 million, compared with a net loss of about $244 million in 1982.

The only company with positive earnings in the fourth quarters of both 1982 and 1983 was Exxon, whose earnings from chemicals increased 432% to $117 million in the latest quarter. Other companies all improved results, going from losses in fourth-quarter 1982 to gains in the last three months of 1983.

On a full-year basis, two companies had positive earnings in both 1982 and 1983. Exxon's chemical earnings increased 187% from 1982 to $267 million. Getty Oil posted an increase in petrochemical earnings of 201% to $55.4 million.

The reasons for the marked improvement in petrochemical earnings were much the same as for the rise in earnings at basic chemical companies. Gulf says that the turnaround in the economy resulted in higher volumes and prices. Also, the company says, benefits were realized from operating efficiency and cost reduction measures.

At Shell, president John F. Bookout says that chemical earnings for both the quarter and the year benefited from improved margins and higher sales volumes. "Chemical results have continued their steady recovery from recession lows as sales volumes have grown and cost-reduction programs are taking hold," he says.

Texaco, which still showed a loss in the fourth quarter, had pricing problems. Texaco says that in 1983 petrochemical operation results declined both in the U.S. and abroad chiefly because of lower sales prices. But, the company says, the fourth quarter of 1983 showed improvement over the comparable three months of 1982 as a result of increased sales volume in the U.S.

AFTER-TAX EARNINGS ON CHEMICALS

	Fourth quarter			Full year		
$ Millions	1983	1982	% change	1983	1982	% change
Atlantic Richfield	$ 12.0	$−57.0	def	$ 64.0	$−96.0	def
Exxon	117.0	22.0	432%	267.0	93.0	187%
Getty Oil	75.1	−3.6	def	55.4	18.4	201
Gulf Oil	−69.0	−74.0	def	−76.0	−329.0	def
Mobil	8.0	−9.0	def	8.0	24.0	−67
Shell Oil	24.0	−26.0	def	63.0	−25.0	def
Standard Oil (Ind.)	39.0	−7.0	def	99.0	76.0	30
Texaco	−3.0	−17.0	def	−23.0	4.0	def

def = deficit.

Man-Made Fibers Recovery To Continue

The near-term future for man-made fibers looks encouraging. Following last year's recovery from the 1982 downturn, improvement in sales will continue "at least in the first half of 1984," say market research analysts at Enka, the fibers-producing part of Akzo of the Netherlands.

"The chief locomotive will be the U.S. The stronger the recovery there, the quicker will be the upturn in Western Europe," they note in their most recent annual survey of the industry. "Outlook for capital goods is most encouraging. In the automobile and tire industries, growth is anticipated." And a favorable influence on the business climate also is expected from private consumption.

Last year's 5.8% increase in global production of man-made fibers to 31.94 billion lb all but compensated for the 6.7% decline in 1982. Synthetic fibers (up 7.5% to 24.65 billion lb, the highest level ever), mainly contributed to the gain. Cellulosic yarn and fiber output edged up less than 0.6% to 7.29 billion lb.

Cellulosics, indeed, continue to lose ground to synthetics. Of last year's total man-made fibers production, 23% was cellulosics, 77% synthetics. Ten years previously, the split was one third cellulosics, two thirds synthetics. Looked at another way, between 1973 and 1983, cellulosics output declined an average 1.6% per year, whereas synthetic fibers grew an average 3.8% per year.

Among the synthetics, the production split remains much the same as it has been since 1980. Polyester continues to dominate with 48% (about 11.83 billion lb) of the total. Polyamides account for 28% (slightly more than 6.90 billion lb), and acrylic fiber 19% (4.68 billion lb). The 5% balance (1.23 billion lb) mostly comprises elastomerics, polypropylene, and polyvinyl chloride fibers. Compared to 1982, production of these and the polyamides was ahead 1%, whereas that of acrylics and polyesters was down 1%.

During the past 10 years, output of polyester fibers grew an average of 5.4% annually. Next among the major synthetics were acrylic fibers (3.3%), followed by polyamides (1.5%). The other types of synthetic fibers as a whole grew 6.1% a year.

On a regional basis, the U.S. led 1983 man-made fibers production with some 25% (8.03 billion lb) of the total. Next came Western Europe with almost 21% (6.61 billion lb), and Japan with 12% (3.87 billion lb). The other countries of the world combined shared the 42% balance (13.43 billion lb). The geographic split for synthetics was broadly similar—the U.S. had 28% of output (6.97 billion lb), Western Europe 21% (5.10 billion lb), Japan 12% (2.94 billion lb), and the rest of the world 39% (9.64 billion lb).

The 10-year growth profile shows some interesting comparisons. U.S. synthetics output grew at a yearly average rate of 1.6%, whereas in Japan it was a meager 0.5%, and in Western Europe there was essentially no growth at all. In contrast, the other countries lumped together registered an annual rate of increase of almost 12%.

For the U.S. last year, firming in demand resulted in polyester fiber's output improving about 12% from the 1982 level, according to the Enka study, although at 3.56 billion lb, the amount remained some 15% short of 1981. Polyamides did better—the 24% improvement (to 2.41 billion lb) more than compensated for the previous year's decline. Acrylics registered a relatively weak 7% gain (to 667 million lb). □

World man-made fibers output recovered from slump to 1979 level . . .

Billions of lb (% change from previous year)	1983	1982	1981	1980	1979
U.S.	8.03 (6%)	6.95 (−20%)	8.63 (0.6%)	8.58 (−6.7%)	9.20 (8.0%)
Western Europe	6.61 (4.8)	6.31 (−7.3)	6.81 (4.8)	6.50 (−9.6)	7.19 (1.4)
Japan	3.87 (1.3)	3.82 (−2.6)	3.92 (−1.5)	3.98 (−1.0)	4.02 (0.3)
Other	13.43 (2.4)	13.11 (0.7)	13.02 (5.3)	12.37 (6.7)	11.59 (7.2)
TOTAL	**31.94 (5.8%)**	**30.19 (−6.7%)**	**32.37 (3.0%)**	**31.43 (−1.8%)**	**32.00 (5.2%)**

. . . and synthetics reached an all-time high

U.S.	6.97 (17%)	5.95 (−20%)	7.44 (0.9%)	7.37 (−6.7%)	7.90 (8.6%)
Western Europe	5.10 (7.1)	4.76 (−7.0)	5.12 (8.2)	4.73 (−10)	5.26 (1.5)
Japan	2.94 (1.0)	2.91 (−2.0)	2.97 (−2.0)	3.03 (−1.0)	3.06 (−0.7)
Other	9.64 (3.4)	9.32 (2.9)	9.06 (7.6)	8.42 (9.5)	7.69 (11)
TOTAL	**24.65 (7.5%)**	**22.94 (−6.7%)**	**24.59 (4.4%)**	**22.55 (−1.5%)**	**23.91 (6.4%)**

Source: Enka

Canadian chemical earnings bounced back in 1983

A strong fourth quarter preceded by two other impressive quarters has made 1983 a big turnaround year for the Canadian chemical industry. Gone, in almost all cases, is the red ink that characterized quarterly financial statements in 1982 and the first three months of 1983.

Sales of most Canadian chemical companies bounced back strongly last year, and particularly in the fourth quarter. Profits also have shown a welcome resurgence, although they still languish at levels that are half to a third those in the heyday of 1979 to 1981.

Still, after what the Canadian industry suffered through last year, any improvement in sales and earnings is welcome. Most companies credit the increased sales to higher demand spurred by an improving Canadian and worldwide economy. And, although higher selling prices have contributed to their higher earnings, most chemical companies in Canada are giving most of the credit to belt tightening that they pushed through last year. Reduced inventories, lower capital spending, and better productivity all combined to give them a better earnings picture.

Indicative of the way things went for Canadian chemical companies last year are sales and earnings of the four largest publicly reporting chemical companies, C-I-L Inc., Celanese Canada, Du Pont Canada, and Union Carbide Canada. For the entire year, combined sales of these companies were up a respectable 8.5%. But in the fourth quarter alone, their sales zoomed ahead 19.1%.

Earnings tell a similar story. Combined fourth-quarter earnings were $24.3 million (Canadian), compared to a loss of $5.2 million in 1982. For the entire year, the combined earnings of these four companies swung to a total of $66.7 million from a $15.7 million deficit in 1982.

Leading the earnings surge was Du Pont Canada, which posted a $35.2 million profit in 1983 after a net loss of $7.4 million in 1982. The company managed this on sales of $1.1 billion, the second highest in the company's history and 14% higher than in 1982. Du Pont increased sales in Canada 31%, but exports rose only 26%.

Union Carbide remains the only one of the four large chemical companies to suffer a loss last year, despite an 8.8% increase in sales and a $4.1 million profit in the fourth quarter. Company chairman W. Norman Kissick blames continued high taxes levied on oil-based petrochemical feedstocks and a still sluggish steel industry for the lack of profits.

Union Carbide's exports were hit hard last year. Although Canadian sales were up 5%, exports plummeted 44%. Particularly hard hit were polyethylene exports.

On a percentage basis, Celanese Canada's sales grew the most last year, increasing 23% to $398 million. Its earnings reached $9.0 million after a 1982 loss of $5.6 million.

Strong fourth-quarter results were posted by all company divisions. Ernest H. Drew, Celanese president and chief executive officer, says that pricing in Canadian textile markets improved in the fourth quarter, but imports are keeping price pressure on some chemicals.

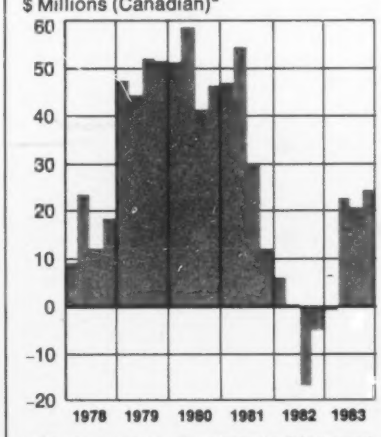
C-I-L, perhaps the most diversified of the four companies, nevertheless managed to increase sales only 5% last year. But the company was the only one to show a profit both in 1982 and last year; it increased that profit to $23.9 million from $15.2 million in 1982.

C-I-L president and chief executive officer C. H. Hantho expects that continued economic recovery this year will push company sales and earnings even higher. Celanese Canada's Drew agrees. He expects better sales and earnings, but cautions that the improvement could be dampened by a strong Canadian dollar compared to European currencies, by methanol prices, and by the level of textile and garment imports allowed into Canada.

The fortunes of many Canadian chemical firms will be influenced also by the government's response to a recently issued petrochemical task force report (C&EN, Feb. 13, page 4). In its report, the industry is asking government assistance, such as lower feedstock prices and financial aid to revamp oil-based petrochemical plants, so that it can regain its competitive edge in domestic and world markets.

Earl Anderson, New York

Combined fourth-quarter earnings rose 24%



a After-tax earnings of four largest publicly reporting Canadian chemical companies—Celanese Canada, C-I-L, Du Pont Canada, and Union Carbide Canada.

Sales up 8.5% for four major Canadian chemical firms

$ Millions (Canadian)	FULL-YEAR 1983 Net sales	Change from 1982	Net income[a]	Change from 1982	Profit margin[b] 1983	1982
C-I-L Inc.	$1114.0	5.1%	$23.9	57.2%	2.2%	1.4%
Celanese Canada	398.4	23.0	9.0	c	2.3	c
Du Pont Canada	1116.4	13.9	35.2	c	3.2	c
Union Carbide Canada	687.0	−0.6	−1.4	c	d	c
TOTAL	$3315.8	8.5%	$66.7	c	2.0%	c

a Net income from continuous operations, excluding extraordinary gains or losses. b Net income as a percentage of sales. c Deficit in 1982. d Deficit in 1983.

EPA Budget Increase Highest For Regulatory Agencies

In reversal of earlier trend, Administration gives EPA 8% rise in fiscal 1985; FDA, OSHA, other agencies get smaller or no spending hikes

For the past few years, the Environmental Protection Agency has served as a first-class example of the Reagan Administration's war on unnecessary and burdensome federal regulation—each new budget proposal contained ever lower funding levels. That trend has now been reversed. Although not all that big, the turnaround is the biggest news in the Administration's generally tight-fisted new budget proposals for regulatory agencies.

The fiscal 1985 budget proposal contains $1.2 billion in operating funds for EPA, a rise of 8% but still 5% less than the agency spent in fiscal 1981. The abatement, control, and compliance budget, which provides the means for assuring that the country's environmental laws are being complied with, would, however, be up less than 1% to $396.0 million, more than 10% below 1981 levels.

Under the proposed budget, spending for the Superfund program will be up 56% to $640 million, with funding for enforcement up 65% to $48.9 million. The agency's overall enforcement budget will be up 27% to $152 million. Also included in the request are increases of 59% to $16.2 million for the pesticide registration program and 28% to $13.7 million for review of existing chemicals under the Toxic Substances Control Act. The budget also contains $1.5 million to enable the agency to initiate a program for regulating commercial uses of genetically engineered materials under TSCA.

Like EPA, the Justice Department is stepping up its enforcement of environmental laws. It is requesting an increase of 13% to $22.6 million for its land and natural resources division. That amount, the department says, will enable it to increase its litigation activities under Superfund 50%.

Other regulatory agencies that in one way or another interact with the chemical community aren't faring so well as EPA. For example, the Food & Drug Administration's budget is slated for a mere 2% rise to $397.6 million, an amount that will allow it to maintain its current level of activities. FDA says that in 1985 it will focus on three priority concerns: bringing safe and effective products to market more rapidly; encouraging voluntary compliance and cooperative industry and government efforts to assist in carrying out agency responsibilities; and keeping FDA's scientific capabilities up to date.

The Occupational Safety & Health Administration's budget also will rise just 2%—to $217.7 billion. The tight budget means that the agency will conduct the same number of inspections in 1985 as it plans this year, 70,500; support the same number of state program inspections, 95,960; and visit the same number of workplaces for consultation, 25,600. OSHA plans to issue eight health and 10 safety standards in 1984. Those numbers will drop to six and seven, respectively, in 1985.

Government support for the Patent & Trademark Office, however, would rise 11% to $101.6 million. That amount would be supplemented by $98.7 million in fees collected for processing patent and trademark applications and disseminating information. PTO says it expects to receive 107,000 patent applications in 1985, the same number as this year, and that total pendency is expected to drop from 25.3 months in 1984 to 24 months in 1985.

EPA's budget would rise 8% . . .

$ Millions	1985[a]	1984[a]	1983[b]
Management	$ 287.8	$ 250.8	$ 240.1
Air	228.8	224.8	214.5
Water quality	217.7	216.2	206.0
Hazardous waste	143.3	128.7	120.1
Toxic substances	79.6	68.8	68.4
Drinking water	79.3	78.7	75.5
Pesticides	63.2	57.3	53.7
Interdisciplinary	48.9	46.1	34.7
Energy	48.5	30.4	25.2
Radiation	12.1	12.3	10.3
TOTAL	$1209.2	$1114.1	$1048.5

Note: Figures include R&D funding

. . . FDA's only 2% . . .

$ Millions	1985[a]	1984[a]	1983[b]
Drugs	$141.3	$138.6	$130.5
Foods	109.3	108.2	103.3
Devices, radiological products	67.0	65.8	58.8
Program management	58.4	54.8	49.4
National Center for Toxicological Research	21.6	21.5	19.6
TOTAL	$397.6	$388.9	$361.6

. . . as would OSHA's

$ Millions	1985[a]	1984[a]	1983[b]
Enforcement	$137.9	$136.3	$130.3
Federal	82.4	81.7	80.1
State	55.5	54.6	50.2
Compliance assistance	37.7	37.6	37.0
Safety and health statistics	16.8	13.0	11.1
Technical support	13.7	13.5	14.1
Safety and health standards	6.2	6.1	6.1
Administration	5.4	6.0	6.7
TOTAL	$217.7	$212.5	$205.3

a Estimate. b Actual. Note: Obligations.

Federal Alert—new regulations

This listing highlights regulations published in the Federal Register *from Dec. 12, 1983, to Jan. 27, 1984. Page numbers refer to those issues.*

PROPOSED

Environmental Protection Agency—Limits emissions of volatile organics from synthetic organic distillation equipment; comments by March 13 (Dec. 30, 1983, page 57538).

Announces required industry toxicity testing for glycidol and derivatives; comments by Feb. 28 (Dec. 30, 1983, page 57562).

Proposes toxicity testing programs by manufacturers for propylene oxide, hydroquinone, and quinone; comments by March 5 (Jan. 4, pages 430, 438, 456).

Sets up toxicity testing program for producers of 1,2-dichloropropane; comments by March 6 (Jan. 6, page 899).

Requires manufacturers to do environmental effects testing on mono-, di-, and trichlorinated benzenes; comments by March 13 (Jan. 13, page 1760).

Gives advance notice of intent to regulate environmental release of 2-methoxy- and 2-ethoxyethanol and their acetates; comments by March 26 (Jan. 24, page 2921).

FINAL

Energy Department—Issues new rules governing price competition for sale of oil from strategic petroleum reserve in case of oil supply cutoff; effective Jan. 20 (Dec. 21, 1983, page 56538).

Environmental Protection Agency—Establishes procedures for carrying out restrictions imposed on imports of hazardous chemicals; effective Dec. 13, 1983 (Dec. 13, 1983, page 55462).

Occupational Safety & Health Administration—Revises record-keeping and reporting requirements for federal employee health and safety programs; effective Jan. 25 (Jan. 25, page 3077).

NOTICES

Environmental Protection Agency—Begins 180-day review of and seeks information on health and safety of workers exposed to 1,3-butadiene for possible regulatory action, acting in concert with OSHA; comments by March 5 (Jan. 5, pages 844, 845).

Declares intent to cancel registration of all pesticide products containing dibromochloropropane; comments by March 12 (Jan. 12, page 1556).

Minerals Management Service—Releases draft environmental impact statement on leasing underwater tracts for mining minerals on the Gorda Ridge, off the northern California coast; comments by Feb. 29 (Jan. 5, page 667).

Funding for the Nuclear Regulatory Commission, on the other hand, would drop 2% to $468.7 million. That budget request does allow for some increases. For example, the budget for inspection and enforcement would rise 12% to $92.2 million and that for materials, safety, and safeguards 13% to $45.5 million.

Some of the smaller regulatory agencies are barely holding their heads above water. Funding for the Consumer Product Safety Commission is scheduled to hold steady in 1985 at $35.3 million; the total number of employees will drop by one to 557. In fiscal 1981, for comparison, the agency had a budget of more than $42 million and 889 employees.

Funding for the Council on Environmental Quality, which was set up to review federal government programs having an impact on the environment, would be cut almost in half, from $1.3 million in 1984 to $700,000 in 1985. However, funding for another small office—the Office of Science & Technology Policy—would be up 10% to $2.2 million. Funding for the Office of Management & Budget, which usually manages to find ways to cut the programs other agencies want, will be up again, 8% to $40 million.

Janice Long, Washington

Hydrocarbon wastes to be regulated as a group

"One regulation, rather than 25 individual regulations, will cover the wastes of 25 major commercial products," says Lee M. Thomas, assistant Environmental Protection Agency administrator for solid waste and emergency response. He is explaining a precedent-setting action taken by EPA to list and then regulate specific hazardous wastes as a group rather than individually. The group in this case consists of wastes resulting from the production of 25 chlorinated aliphatic (C_1-C_5) hydrocarbons by free radical catalyzed processes.

In effect, some 37 different toxic compounds, including carbon tetrachloride, vinyl chloride, and benzene, are being regulated under the Resource Conservation & Recovery Act by controlling such manufactured products as dry cleaning liquids and degreasing solvents. It is a unique approach to regulation because it is the first time EPA has regulated using a chemical mechanistic approach.

The toxic and sometimes carcinogenic wastes are generated when petroleum products are chlorinated during their conversion to solvents and polymers. EPA estimates that the manufacturers of the 25 major commercial products covered by the rule annually produce about 180,000 metric tons of chlorinated hydrocarbon-tainted wastes. Each of the 25 different waste streams contains one or more of the 37 toxic compounds in high concentrations.

Ruling covers 25 products

Carbon tetrachloride
1-Chlorobutane (*n*-butyl chloride)
Chloroethane (ethyl chloride)
Chloroform (trichloromethane)
2-Chloro-1,3-butadiene (chloroprene)
Chloromethane (methyl chloride)
2-Chloro-2-methylpropane (*tert*-butyl chloride)
3-Chloro-2-methylpropene (methallyl chloride)
3-Chloropropene (allyl chloride)
Dichlorobutadiene
Dichlorobutenes
1,4-Dichlorobutyne
1,2-Dichloroethane (ethylene dichloride)
Dichloromethane (methylene dichloride)
1,2-Dichloropropane
1,3-Dichloropropene
Hexachlorocyclopentadiene
Tetrachloroethylene (perchloroethylene)
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethylene (1,1,2-trichloroethene)
1,2,3-Trichloropropane
1,2,3-Trichloropropene
Vinyl chloride (chloroethene)
Vinylidene chloride (1,1-dichloroethene)

This interim final regulation, published in the Feb. 10 issue of the *Federal Register*, becomes final in six months. It follows by four years EPA's previous action that regulated individual waste streams that in the aggregate amounted to 1.5 million metric tons of chlorinated hydrocarbon-contaminated wastes. □